2.0 CHEMICAL COMPATIBILITY OF EQUIPMENT AND THE WATER SAMPLE

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The materials used to construct equipment can directly affect sample chemistry (table 2-1). Equipment designed for water-quality work commonly is constructed of a combination of materials, the most inert being used for components that will contact the sample. Nonsample-wetted components also can be a source of sample contamination, and field personnel must use techniques to minimize potential contamination, implement quality-assurance procedures, and quantify potential effects by using quality-control sample analysis.

When planning equipment use, consider having several sets of precleaned equipment available. A clean set of equipment for each sampling site prevents cross contamination between sites, eliminates the need for time-consuming equipment cleaning in the field, and serves as backup should equipment break or become greatly contaminated.

Check that the equipment to be used will not affect the sample chemistry.

Materials used in equipment can include plastics, glass, and metals. Chemical reactivity varies widely within the same group of materials, depending on the chemical composition, the physical configuration, and the manufacturing process. Thus, regarding reactivity with water and most other chemical substances, plastics such as fluorocarbon polymers are less reactive than plastics such as polyethylene, and 316-type stainless steel (SS 316) is less reactive than brass, iron, or galvanized steel. For plastics and metals in general:

- The softer or more flexible forms of any plastic or metal are more reactive than the rigid forms.
- The more polished the surface, the less reactive the material tends to be.

Table 2-1. General guidelines for selecting equipment on the basis of construction material and target analyte(s)

[✓, generally appropriate for use shown; Si, silica; Cr, chromium; Ni, nickel; Fe, iron; Mn, manganese; Mo, molybdenum; $^3H/^3He$, tritium/helium-3; CFC, chlorofluorocarbon; B, boron]

Construction material for sampling equipment (does not apply to well casing)		Target analyte(s)	
Material	Description	Inorganic	Organic
Plastics[1]			
Fluorocarbon polymers[2] (other varieties available for differing applications)	Chemically inert for most analytes.	✓ (Potential source of fluoride.)	✓ (Sorption of some organics.)
Polypropylene	Relatively inert for inorganic analytes.	✓	Do not use.
Polyethylene (linear)	Relatively inert for inorganic analytes.	✓	Do not use.
Polyvinyl chloride (PVC)	Relatively inert for inorganic analytes.	✓	Do not use.
Silicone	Very porous. Relatively inert for most inorganic analyte(s).	✓ (Potential source of Si.)	Do not use.
Metals[3]			
Stainless steel 316 (SS 316)	SS-316—metal having the greatest corrosion resistance. Comes in various grades. Used for submersible pump[3] casing.	✓ (Potential source of Cr, Ni, Fe, and possibly Mn and Mo.) Do not use for surface water unless encased in plastic (does not apply to submersible pumps).	✓ Do not use if corroded.[4]
Stainless steel 304	Similar to SS 316, but less corrosion resistant.	Do not use.	✓ Do not use if corroded.[4]
Other metals: brass, iron, copper, aluminum, galvanized and carbon steels	Refrigeration-grade copper or aluminum tubing are used routinely for collection of $^3H/^3He$ and CFC samples.	Do not use. (except as noted for isotopes).	✓ Routinely used for CFCs. Do not use if corroded.
Glass			
Glass, borosilicate (laboratory grade)	Relatively inert. Potential sorption of analytes.	✓ Potential source of B and Si.	✓

[1]Plastics used in connection with inorganic trace-element sampling must be uncolored or white (Horowitz and others, 1994).
[2]Fluorocarbon polymers include materials such as Teflon™, Kynar™, and Tefzel™ that are relatively inert for sampling inorganic or organic analytes.
[3]Most submersible sampling pumps have stainless steel components. One can minimize effects on inorganics sample by using fluorocarbon polymers in construction of sample-wetted components (for example, for a bladder, stator, impeller) to the extent possible.
[4]Corroded/weathered surfaces are active sorption sites for organic compounds.